INSTRUCTIONS
for
INSTALLATION
and MAINTENANCE
of
MODEL 10
CROSSING SIGNALS
EQUIPPED WITH
TYPE 3564 GATE MECHANISM

WESTERN RAILROAD SUPPLY CO.
DIVISION OF WESTERN INDUSTRIES, INC.
MANUFACTURERS

GENERAL OFFICES and FACTORY
2742 WEST 36TH PLACE • CHICAGO 32, ILLINOIS

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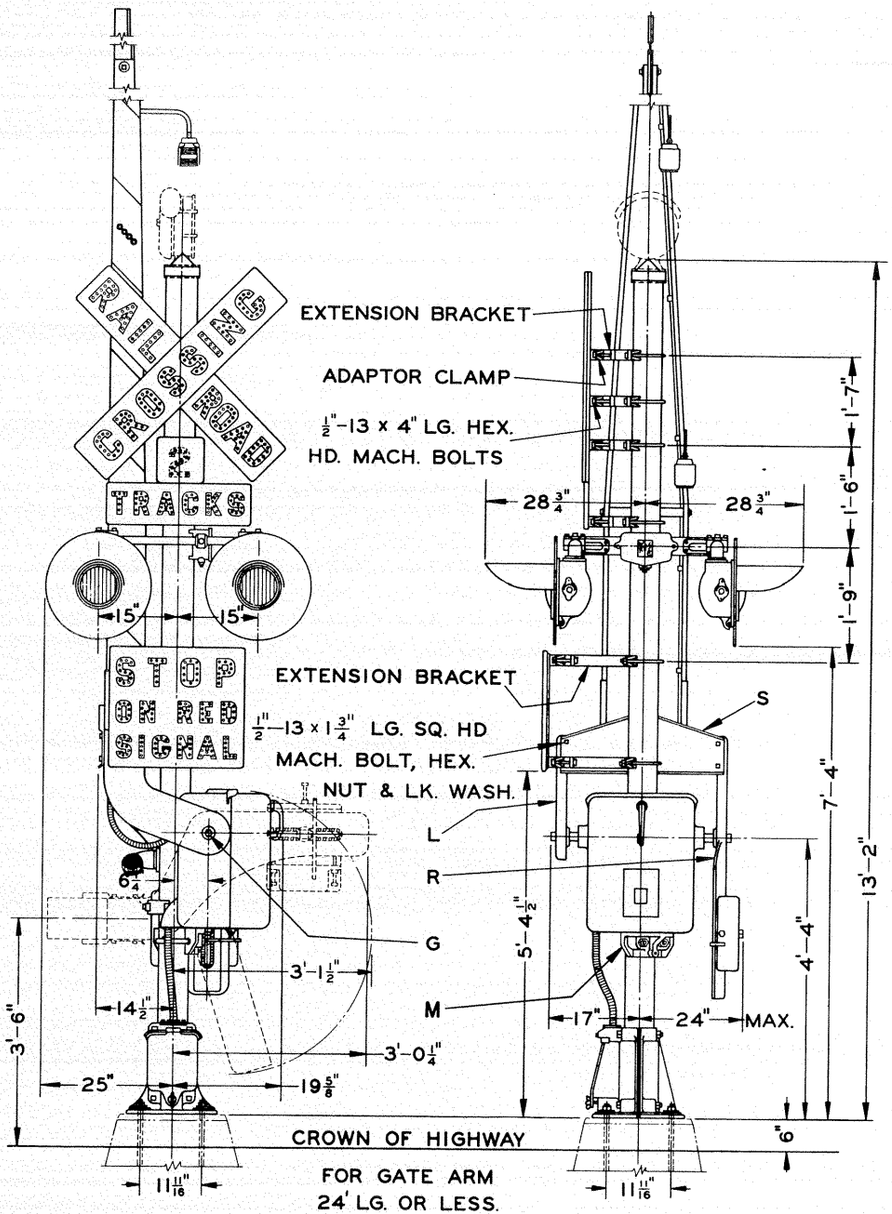
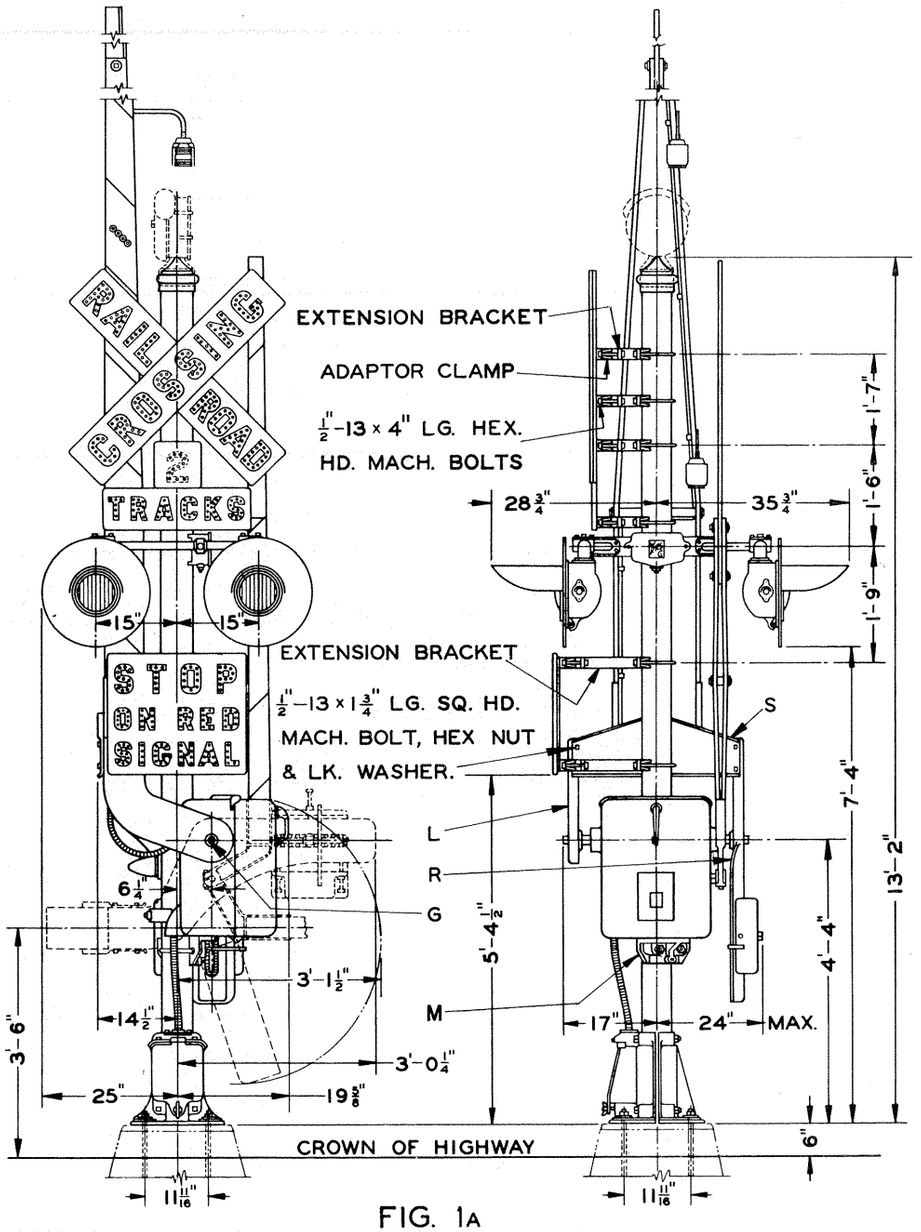

RAILROAD CROSSING
TRACKS
STOP ON RED SIGNAL
EXTENSION BRACKET
ADAPTOR CLAMP
½"-13 x 4" LG. HEX. HD. MACH. BOLTS
EXTENSION BRACKET
½"-13 x 1¾" LG. SQ. HD MACH. BOLT, HEX. NUT & LK. WASH.
28¾"
28¾"
15"
15"
1'-7"
1'-6"
1'-9"
7'-4"
13'-2"
5'-4½"
4'-4"
S
L
R
G
M
6¼"
3'-1½"
14½"
3'-0¼"
25"
19⅝"
17"
24" MAX.
3'-6"
6"
CROWN OF HIGHWAY
FOR GATE ARM 24' LG. OR LESS.
11 11/16"

FIG 1


RAILROAD CROSSING
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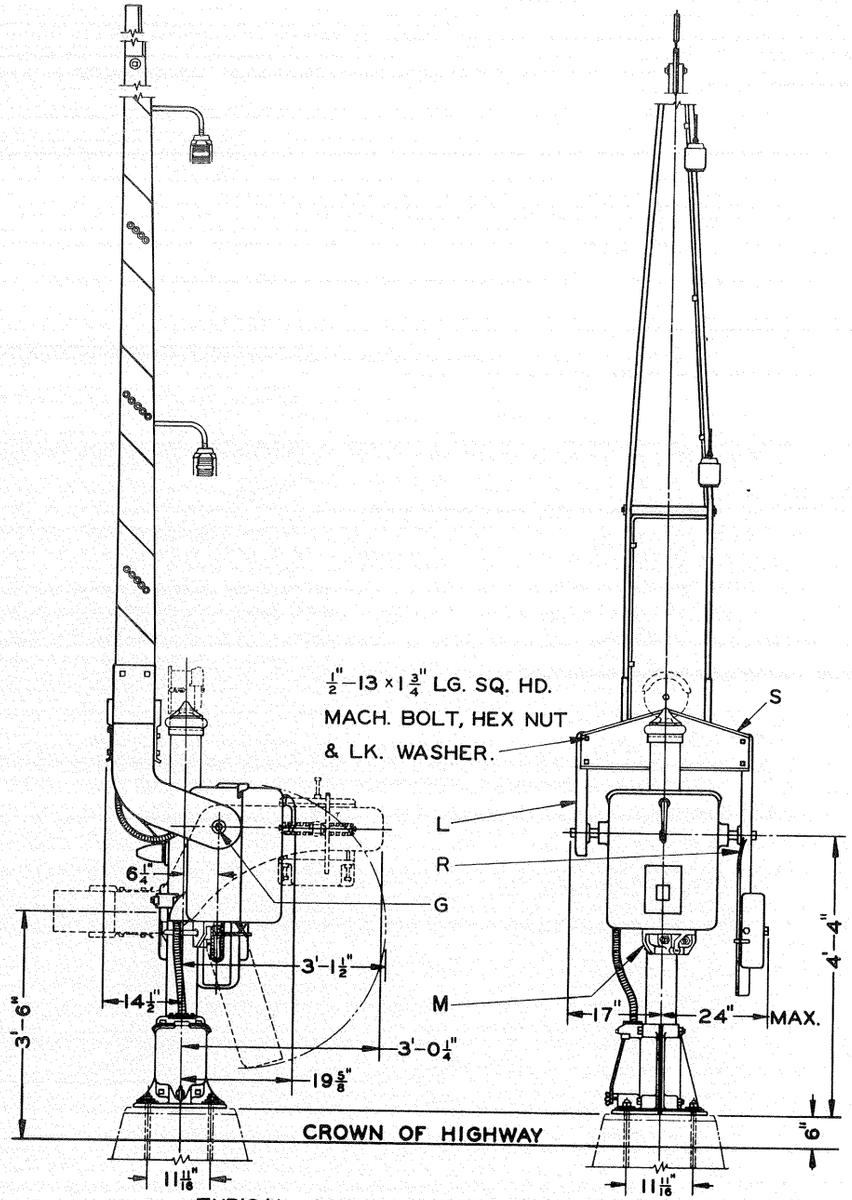
EXTENSION BRACKET
½"-13 x 1¾" LG. SQ. HD. MACH. BOLT, HEX NUT & LK. WASHER.
28¾"
35¾"
15"
15"
1'-7"
1'-6"
1'-9"
7'-4"
13'-2"
5'-4½"
4'-4"
S
L
R
G
M
6¼"
3'-1½"
14½"
3'-0¼"
25"
19⅝"
17"
24" MAX.
3'-6"
6"
CROWN OF HIGHWAY
11 11/16"

FIG. 1A



TYPICAL ASSEMBLY ON SHORT MAST
AS USED WITH CANTILEVER SIGNALS

FIG. 1B

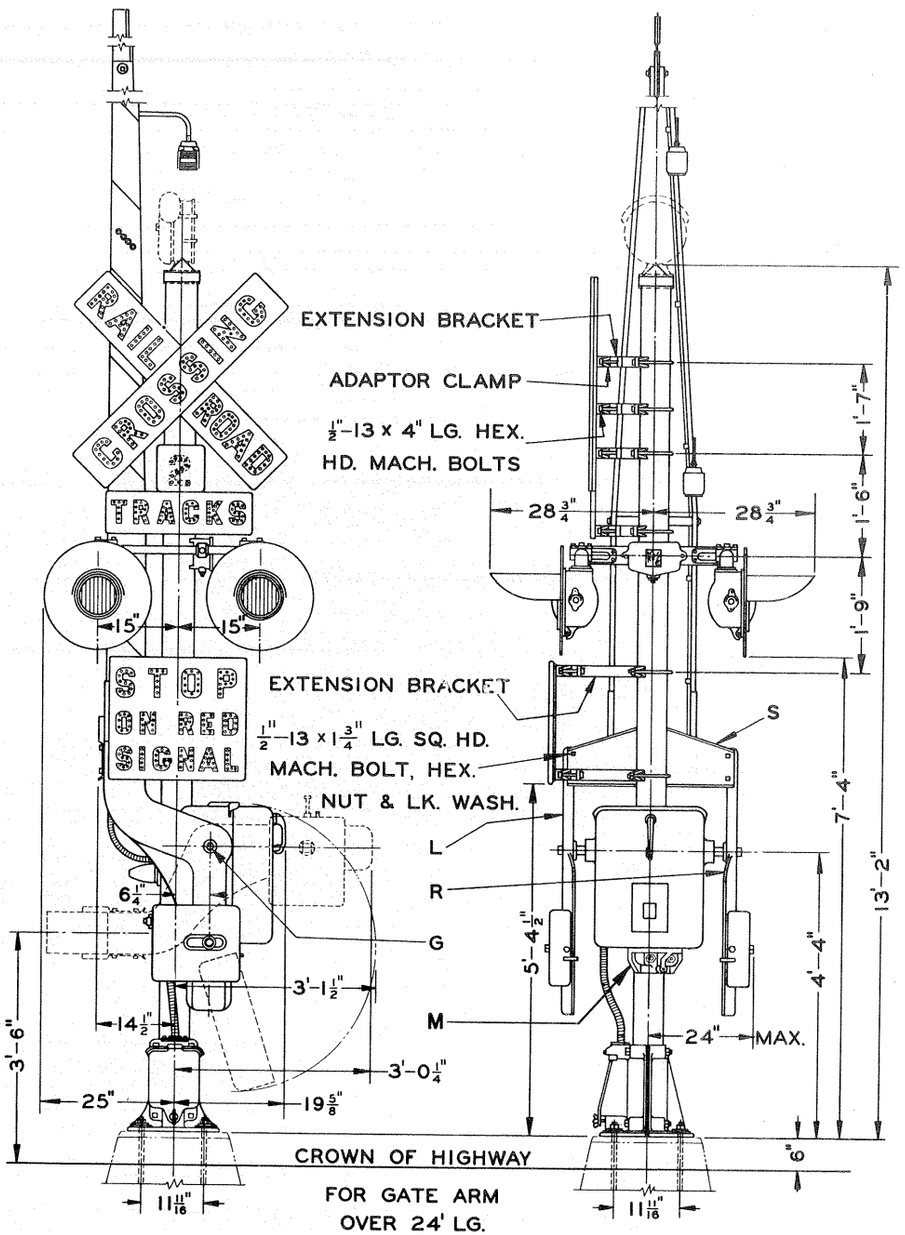
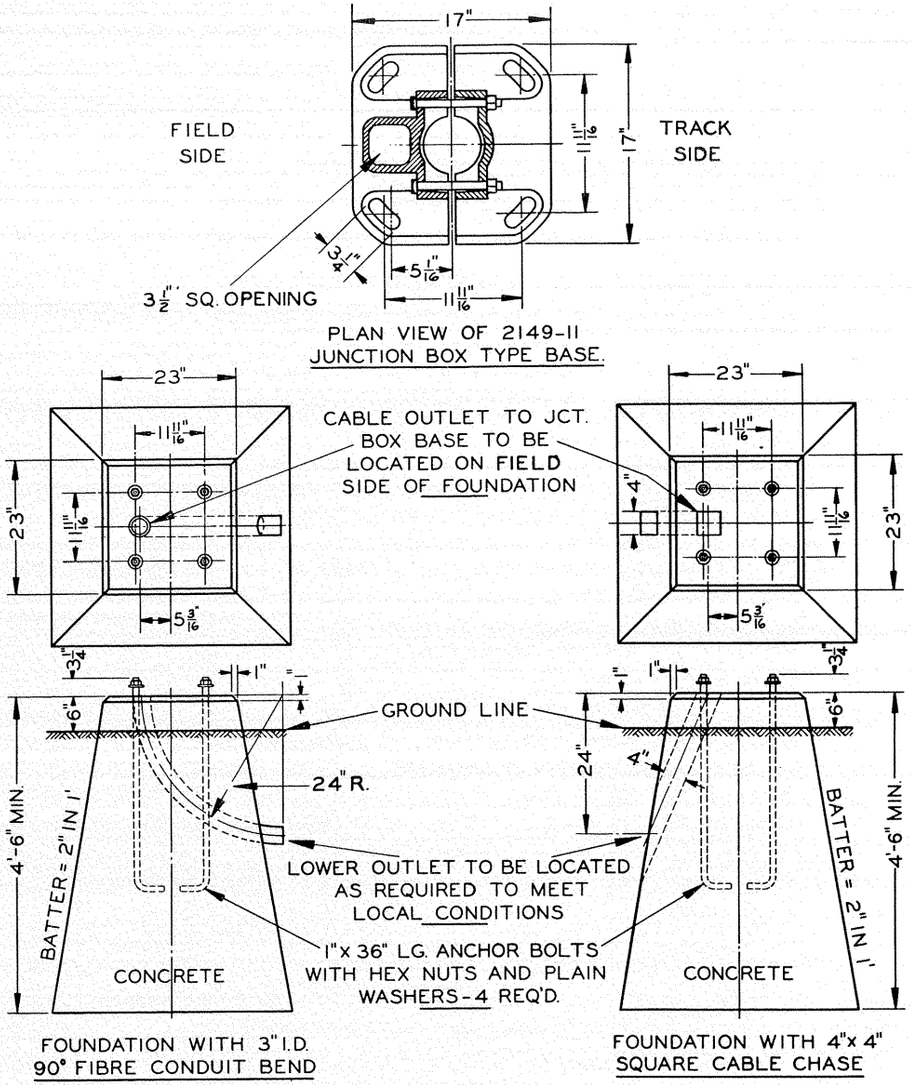


FIG. 2


17"
FIELD SIDE
TRACK SIDE
17"
3½" SQ. OPENING
PLAN VIEW OF 2149-11 JUNCTION BOX TYPE BASE.
23"
CABLE OUTLET TO JCT. BOX BASE TO BE LOCATED ON FIELD SIDE OF FOUNDATION
GROUND LINE
24" R.
LOWER OUTLET TO BE LOCATED AS REQUIRED TO MEET LOCAL CONDITIONS
1"x 36" LG. ANCHOR BOLTS WITH HEX NUTS AND PLAIN WASHERS - 4 REQ'D.
CONCRETE
BATTER = 2" IN 1'
4'-6" MIN.
FOUNDATION WITH 3" I.D. 90° FIBRE CONDUIT BEND
FOUNDATION WITH 4"x 4" SQUARE CABLE CHASE

Suggested Foundation Designs For Model 10 Signals
Using No. 2149-11 Junction Box Type Base

SECTION 1

DETAIL INSTRUCTIONS
For
ERECTING
MODEL 10 SIGNAL WITH TYPE 3564D MECHANISM

Operations should be performed in the following order:

1. INSTALL JUNCTION BOX TYPE CLAMP BASE AND MAST making sure that junction box half of base is in proper position with relation to the roadway, as shown in Figures 1, 1a, 1b and 2, and that opening in mast for junction box Crossarm for flashing lights is in proper position as shown in Figures 1, 1a and 2.

   Note: Place pipe shield, which will be found in the junction box of the base, in lower end of mast before installing the mast in the base.

2. CLAMP THE TYPE 3564D MECHANISM TO THE MAST on the side away from the roadway so that the shaft is 4′ 4″ above the top of the foundation. The shaft should then be 4′ 10″ above the crown of the street to bring the gate arm to the proper height. (See Figures 1, 1a, 1b and 2.)

3. MAKE SURE THE MAIN SHAFT IS IN THE POSITION IT ASSUMES WHEN THE GATE ARM IS HORIZONTAL. This condition exists when gear segment O is in contact with the head of stop screw C as shown in Figure 8.

4. REMOVE NUTS, WASHERS AND SPLINE PROTECTORS (G9 and G10, Figure 10) from ends of main shaft.

5. APPLY GATE AND COUNTERWEIGHT SUPPORT ARMS (R and L, Figures 1, 1a, 1b and 2) keeping the gate end in the horizontal position (shown dotted) when applying to shaft. Replace washers, lock washers and nuts on ends of main shaft but **DO NOT TIGHTEN THE NUTS.**

6. APPLY SHEET STEEL GATE SUPPORT (S, Figures 1, 1a, 1b and 2) between arms R and L, insert bolts, apply lock washers and nuts, then tighten securely.

7. NOW TIGHTEN NUTS on end of main shaft (G, Figures 1, 1a, 1b and 2).

   When this assembly is complete and free to rotate, its natural position, due to gravity, is approximately 30° above the horizontal.

8. REMOVE BOLTS, NUTS AND WASHERS from mechanism end of wood gate arm assembly.

9. DO NOT APPLY COUNTERWEIGHTS before roadway gate arm is installed. See Paragraphs 10 and 12.

10. SLIDE GATE ARM INTO CHANNELS OF SUPPORT S, insert bolts, apply washer plates on inner sides of wood side boards, install lock washers and nuts, tightening securely.

IF SIDEWALK ARM IS USED the mechanism is supplied with an additional shaft which has a square section extension on one side only of the mechanism case. (See Figure 1a.) Sidewalk arm should be applied with arm in horizontal position corresponding with the position of the roadway arm. Sidewalk arm support casting should be applied before supports R and L.

However do not apply wood sidewalk arm until torque has been adjusted. (See Paragraph 13.)

MECHANISMS FOR OPERATING BOTH ROADWAY AND SIDEWALK ARMS are normally assembled at the factory with the sidewalk arm shaft projecting from the right side of the mechanism case, as shown in Figure 1a and Figure 10. It can, however, be made to project from the left side, when clearances require, by interchanging bushing J2 and end plate J3, Figure 10, and turning the shaft end for end. When this is done it is necessary to use the same **long** extension brackets for supportang the Railroad Crossing and Number of Tracks signs as are used for supporting the Stop On Red Signal sign and to interchange the **short** and **long** brackets of the Junction-box Crossarm to provide clearance for the sidewalk arm when in the clear position.

11. INSTALL BAKELITE TERMINAL BLOCKS on gate arm by means of wood screws furnished. Holes are spotted on arm to facilitate application and correctly locate terminal blocks. Next install gate lights attaching the wires from the gate arm wiring harness and lead wires from gate lights to binding posts of terminal block leaving proper drip loop. Apply covers to terminal block with side opening toward mechanism end of arm.

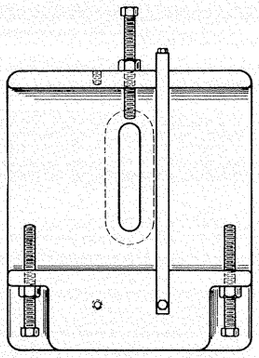


FIG. 3

160 POUND WEIGHT

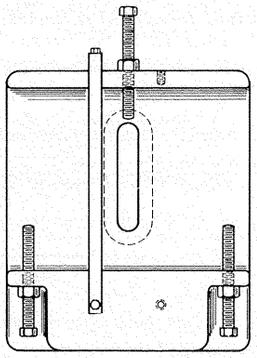


FIG. 3A

12. ATTACH COUNTERWEIGHTS, following the instructions below and diagrams referred to. The correct weights are furnished for each gate arm and these are indicated on a tag attached to the inside of each arm near the mechanism end. For safety have a man hold gate arm in horizontal position while applying counterweights.

Where gate arms are not more than 24′ long, only one counterweight support arm R is used. The other gate support arm L has no extension for mounting a counterweight. (See Figures 1, 1a, 1b and 7.) Where gate arms exceed 24′ in length, two counterweights are required and there are extensions for mounting counterweights on both support arm R and support arm L. (See Figures 2 and 6.)

(a) IF GATE ARM IS NOT OVER 24 FEET LONG assemble retaining strap to 160# counterweight as shown in Figures 3, 4 and 5, for attaching to support arm R, Figure 7.

(b) IF GATE ARM IS OVER 24 FEET IN LENGTH assemble retaining strap to one 160# weight, as in Figures 3, 4 and 5, for attaching to support arm R, Figure 7, and to the other weight, as in Figures 3a and 5, for attaching to support arm L, Figure 6.

(c) Place 160# weight or weights in position with heavy side down, and slide near the middle of the slot, as in Figure 4.

(d) Insert clamp washer and 1″ bolt, as in Figures 4 and 5. If additional weights are used, assemble as shown by dotted lines in Figure 5.

(e) Apply washer and nut, but tighten only lightly.

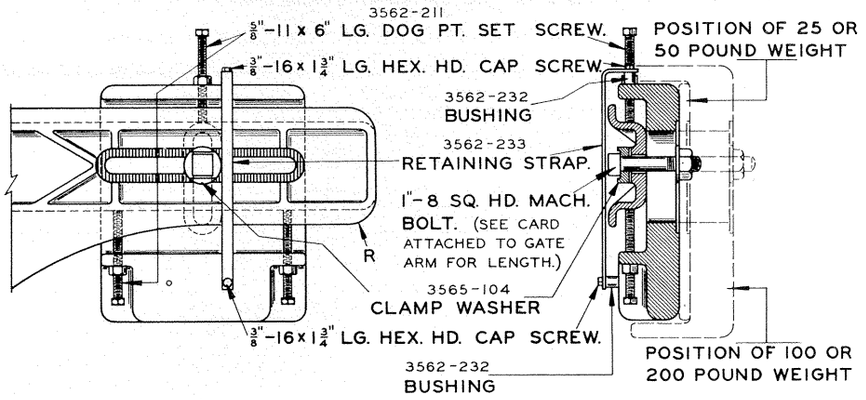

3562-211
5/16"-11 x 6" LG. DOG PT. SET SCREW.
3/8"-16 x 1 3/4" LG. HEX. HD. CAP SCREW.
3562-232 BUSHING
3562-233 RETAINING STRAP.
1"-8 SQ. HD. MACH. BOLT. (SEE CARD ATTACHED TO GATE ARM FOR LENGTH.)
R
3565-104 CLAMP WASHER
3/8"-16 x 1 3/4" LG. HEX. HD. CAP SCREW.
3562-232 BUSHING
POSITION OF 25 OR 50 POUND WEIGHT
POSITION OF 100 OR 200 POUND WEIGHT

FIG. 4

FIG. 5

13. ADJUST HORIZONTAL TORQUE to 50 foot pounds (see Figure 6) by loosening the nut on bolt B and sliding weight C in or out until scale reads 10 pounds at a point 5 feet from the center of the main shaft, indicating a torque of 50 foot pounds.
Where sidewalk arm is used torque adjustments should be made before sidewalk arm is applied.

For your convenience, a notch is cut in the under edge of one of the wood side boards of each gate arm. This notch is 5′ 0″ horizontally from the center of the shaft, and its location is indicated by an arrow on a card attached to the inside of the gate arm.

TO ADJUST HORIZONTAL TORQUE

DIRECTIONS
LOOSEN NUT ON BOLT "B" AND SLIDE WEIGHT "C" IN OR OUT UNTIL SCALE READS 10 POUNDS AT 5'-0" FROM CENTER LINE OF SHAFT.

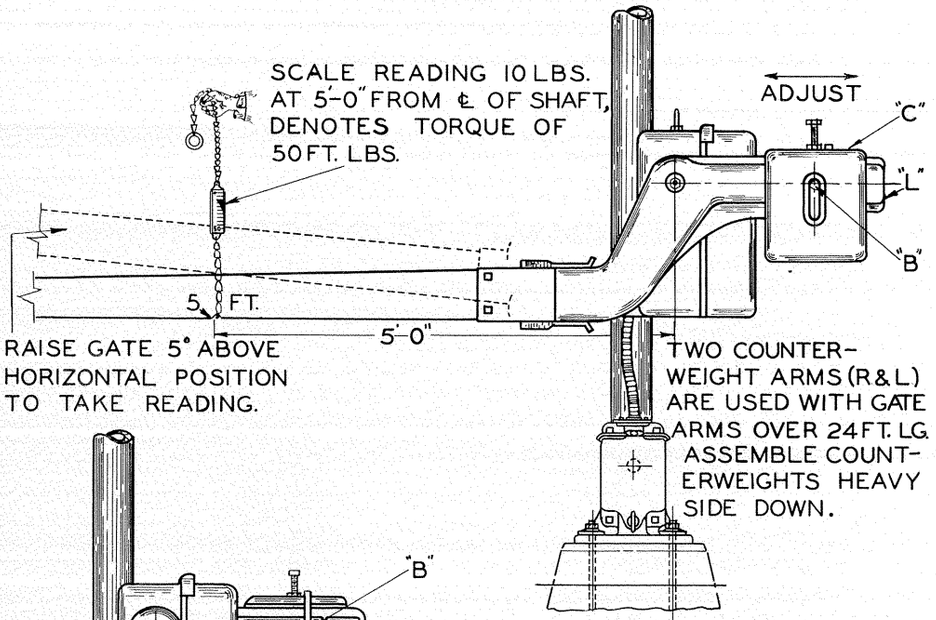

SCALE READING 10 LBS. AT 5'-0" FROM ℄ OF SHAFT, DENOTES TORQUE OF 50 FT. LBS.
ADJUST
"C"
"L"
"B"
5 FT.
5'-0"
RAISE GATE 5° ABOVE HORIZONTAL POSITION TO TAKE READING.
TWO COUNTER-WEIGHT ARMS (R & L) ARE USED WITH GATE ARMS OVER 24 FT. LG. ASSEMBLE COUNTERWEIGHTS HEAVY SIDE DOWN.

FIG. 6

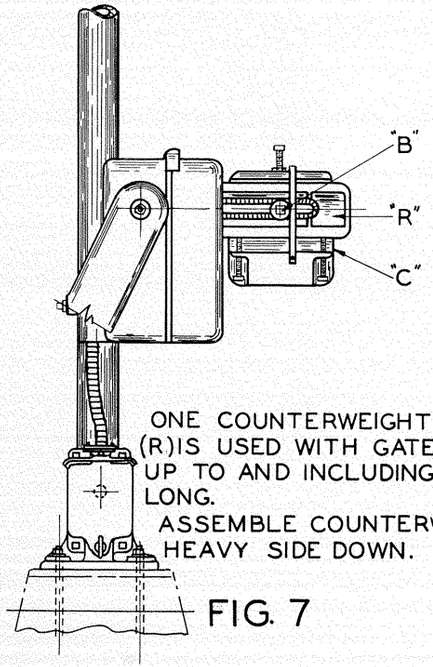


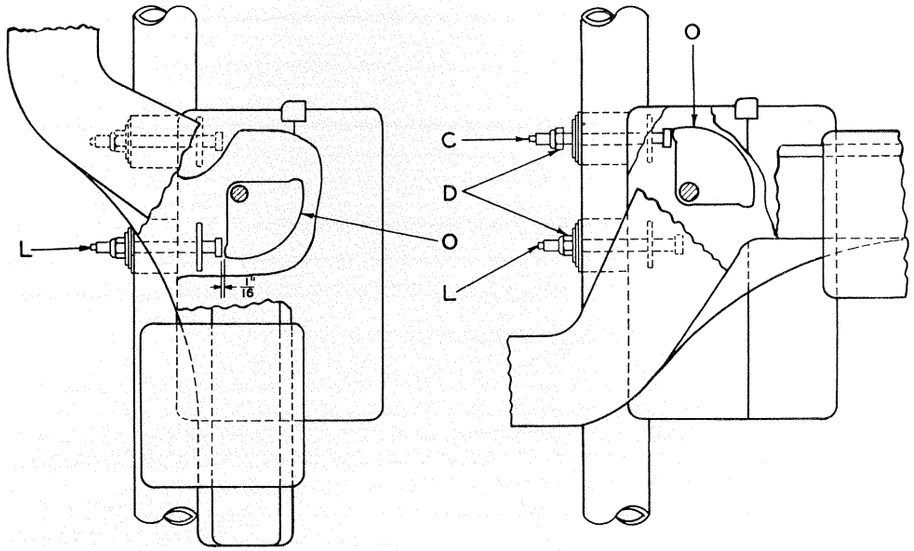
FIG. 7

NOTES:
(1) LENGTH OF GATE ARM IS MEASURED FROM CENTER LINE OF MAST.
(2) WHERE SIDEWALK ARM IS USED DO NOT APPLY UNTIL TORQUE ADJUSTMENTS HAVE BEEN MADE.

When proper torque adjustment has been obtained, tighten nut on bolt B just enough to prevent weight from sliding lengthwise in the slot.

14. ADJUST HORIZONTAL SPRING STOP. Referring to Figure 8, remove cover from upper spring stop adjusting screw C, loosen lock nut D half a turn, and turn adjusting screw C (holding nut D) in or out until gate arm assumes satisfactory horizontal position. Re-tighten nut D, holding screw C.

15. ADJUST CLEAR POSITION SPRING STOP. Referring to Figure 8, raise gate arm by power to desired clear position (usually 90°) and hold it there. Remove cover from lower spring stop adjusting screw L, loosen lock nut D half a turn, and turn adjusting screw L (holding nut D) in or out until there is 1/16" clearance, as indicated, between the head of the screw L and gear segment O. Repeat operation by power to check.



90° OR CLEAR POSITION

FIGURE 8

0° OR HORIZONTAL POSITION

16. ADJUST CLEAR POSITION TORQUE. Raise gate arm by power to clear position and allow to latch. Attach spring scale, as shown in Figure 9, Page 12, using distance from center of shaft corresponding with gate arm length as indicated in right hand columns of table. If Drive-Down type mechanism and circuit are used, open the drive-down motor circuit as no power should be connected to contact in space O during this adjustment. Open hold clear circuit allowing gate arm to fall back about 5° until the weight is supported by the scale and chain and read scale. Loosen nut on bolt or bolts B just enough to permit adjustment (about one-half turn), shifting counterweight C in direction of arrow by means of screws A and D until scale reading

agrees with value shown in table for the corresponding length of gate arm.

Tapping the nut on bolt B in the direction opposite to the adjustment being made will prevent binding.

Tighten bolt B and lock nuts on screws A and D to prevent slipping of weight.

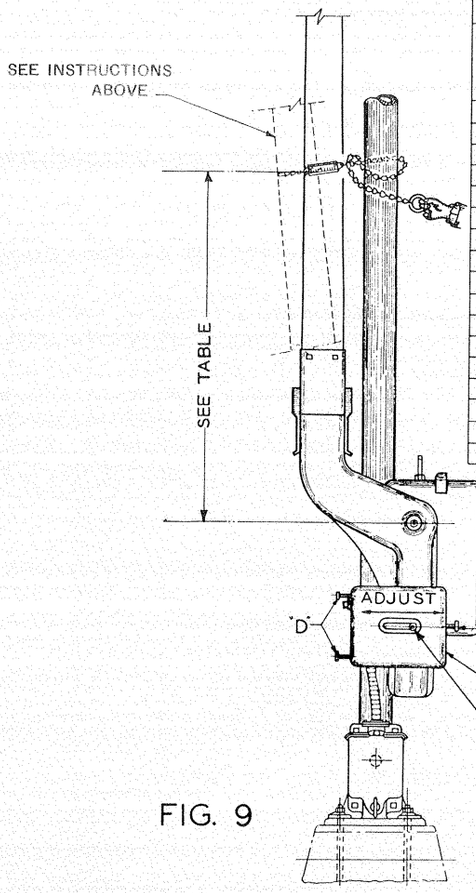


FIG. 9

TABLE OF TORQUE VALUES

SPECIFIED GATE ARM LENGTH IN FEET	CLEAR TORQUE IN FOOT POUNDS	SCALE READING IN LBS. AT DISTANCE SHOWN FROM ℄ OF BEARING.				
		5-FT.	7-FT.	8-FT.	9-FT.	10-FT.
15 TO 24	200	40				
25	220	44				
26	240	48				
27	250	50				
28	266		38			
29	280		40			
30	301		43			
31	308		44			
32	315		45			
33	343		49			
34	369				41	
35	387				43	
36	405				45	
37	432				48	
38	450				50	
39	470					47
40	480					48

NOTES.
(1) LENGTH OF GATE ARM IS MEASURED FROM CENTER LINE OF MAST.
(2) WHERE SIDEWALK ARM IS USED DO NOT APPLY WOOD ARM UNTIL TORQUE ADJUSTMENTS HAVE BEEN MADE AS TORQUE WOULD BE LOW IF ARM SHOULD BE BROKEN OFF.

17. ADJUST MOTOR CUTOUT. Referring to Figure 10, adjust cam C12 in contact space 4 which controls the motor cutout contact C19 so that the gate stops, when operated by power, in the desired clear position. To adjust circuit controller cams, first loosen clamp screw C11, then turn adjusting screw C10, and finally retighten clamp screw C11. **Re-check adjustment of clear position spring stop.** See Paragraph 15.

18. ADJUST DESCENDING TIME.

The descending time of the gate arm is regulated by means of the adjustable resistance on the outside of the slot case, No. 12, Figure 12. The normal descending time should be between 10 and 15 seconds, depending upon gate arm length and local requirements. Long gate arms should usually operate somewhat slower than short arms. However, arms of unequal length at the same crossing can be adjusted to descend at equal rates.

Care should be taken to see that the slide contact on the resistance unit is bearing on the winding with firm pressure, and that the lock nut is tightened to hold the slide securely in place.

19. CHECK THE RELEASE OR DROP-AWAY OF THE SLOT.

The removable cover of the slot assembly contains a sticker showing the maximum and minimum Drop-Away value to which the mechanism was calibrated at the factory. Before placing the mechanism in service, and periodically thereafter, the Drop-Away voltage should be taken with a voltmeter and a slide resistance. It is recommended that, should the measured drop-away voltage of mechanisms in service be found to have gradually reduced to the "Min. Drop-Away (field value) shown on the sticker, the slot be removed for overhauling to bring it back within the "Max." and "Min. Drop-Away (new)" values shown on the sticker.

20. CHECK THE CLEARING TIME.

The gate should clear from horizontal to vertical position within 8 to 12 seconds (see General Instructions Section 2, B) and this time should be verified with a stop watch before the gate is placed in service, to insure that the battery and all electric connections are in satisfactory working condition.

21. MAKE FINAL INSPECTION.

The gears should all be inspected before placing the mechanism in service to insure that they are clean and sufficiently lubricated to prevent rust. The slot armature and pole faces should be wiped with a clean, dry cloth to insure that they are free of all dirt, oil or grease which might later cause them to stick. Finally see that corks are removed from both street-ell ventilators.

22. INSTALL FLASHING LIGHT JUNCTION BOX CROSS ARM and flashing light units. When sidewalk gate arm is used long brackets of junction box cross arm must be installed on same side of mast as sidewalk arm.

23. ATTACH SIGN EXTENSION BRACKETS to the adaptor clamps on the back of the signs by means of the short bolts and nuts furnished with the extension brackets, and attach the extension brackets to the mast with the "U"-bolts furnished with the signs.

24. PLACE BELL OR PINNACLE ON MAST.

A bell, if used, should be placed with the gong parallel with the roadway; the sound thrown out by the edge of the gong is thus strongest parallel with the roadway. Bells are shown correctly mounted in Figures 1, 1a, 1b and 2.

25. MECHANISM SUPPORT.

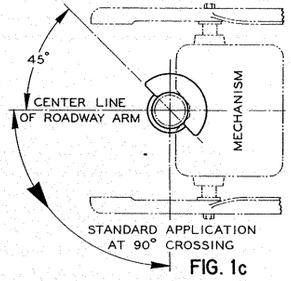
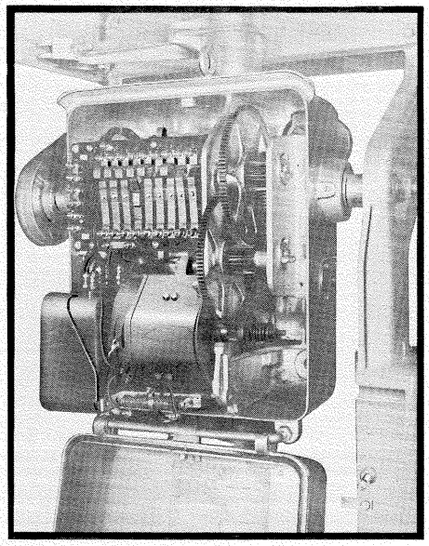
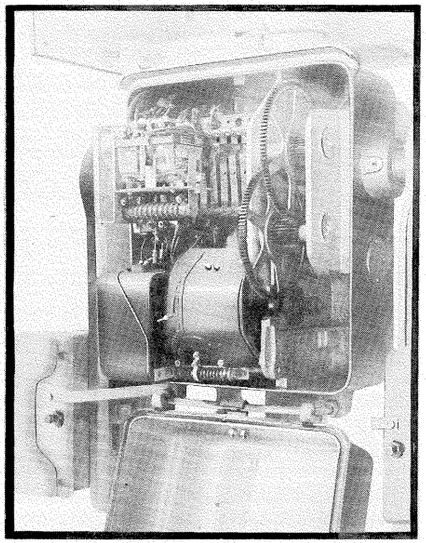


FIG. 1c

Attach support M to the mast and against the underside of the mechanism as shown in Figures 1, 1a, 1b and 2. When necessary to replace a gate arm or work on the mechanism with the gate arm in the horizontal position, loosen mechanism clamp bolts and remove 3/8" cap screws holding conduit flange to the top of the junction box base. When traffic permits open "motor up" and "slot" circuits of mechanism and swing mechanism and gate arm assembly away from track until arm is parallel to curb or highway edge. (See Fig. 1c.)


Gravity Down Type


Power Down Type

SECTION 2

GENERAL INSTRUCTIONS

MECHANISM OPERATION AND MAINTENANCE

A. Gate Arm Torque:

Counterweights are supplied to suit the particular length and weight of gate arm furnished. They will provide suitable torque for both horizontal and clear position, as given in Paragraphs 13 and 16.

CALIBRATION VALUES shown on the sticker inside the slot cover apply to all gate arm torques. The drop-away voltages shown are specification values. The drop-away voltage will not vary appreciably when taken with full gate torque and with no gate torque. It is recommended that, should the drop-away voltage of mechanisms in service be found to have gradually reduced to the "Min. Drop-Away (field value)" shown on the sticker, the slot be removed for overhauling to bring it back within the "Max. Drop-Away (new)" and "Min. Drop-Away (new)" values shown on the sticker. See Paragraph 19, Section 1.

B. Tests for Operation:

Mechanisms are given a final inspection and are properly lubricated before shipment from the factory.

Before placing any mechanism in service, inspection should be made to insure that there is no oil, grease or dirt on the armature or pole faces of the slot magnet or snubbing relay. These parts should be kept clean at all times. See Paragraph 21.

ELECTRICAL TESTS should be made before placing in service, and at regular intervals. Mechanisms located in dense traffic zones should be tested more frequently than under average conditions. See Paragraph 19.

The SNUBBING RELAY, No. 8, Figure 12a, located inside the slot case of gravity type mechanisms or the MOTOR CONTROL AND SNUBBING RELAY, Item R. Figure 10, located on a swing bracket in front of the circuit controller of drive-down type mechanisms, is connected in multiple with the motor and should open its back contact or contacts before closing its front contact to energize the motor whenever energy is applied to drive the gate toward the clear position. When the gate is stationary at either the horizontal or clear position, and while the gate is moving toward the horizontal position, the relay armature should be in the de-energized position with its back contact or contacts closed.

THE TIME FOR THE GATE TO DESCEND from the clear position to the horizontal position should be not more than 15 seconds, nor less than 10 seconds. Descending time may be regulated by means of the adjustable snubbing resistance on the outside of the slot case, No. 12, Figures 12 and 12a, as described in Paragraph 18.

23. ATTACH SIGN EXTENSION BRACKETS to the adaptor clamps on the back of the signs by means of the short bolts and nuts furnished with the extension brackets, and attach the extension brackets to the mast with the "U"-bolts furnished with the signs.

24. PLACE BELL OR PINNACLE ON MAST.

A bell, if used, should be placed with the gong parallel with the roadway; the sound thrown out by the edge of the gong is thus strongest parallel with the roadway. Bells are shown correctly mounted in Figures 1, 1a, 1b and 2.

25. MECHANISM SUPPORT.

Attach support M to the mast and against the underside of the mechanism as shown in Figures 1, 1a, 1b and 2. When necessary to replace a gate arm or work on the mechanism with the gate arm in the horizontal position, loosen mechanism clamp bolts and remove 3/8" cap screws holding conduit flange to the top of the junction box base. When traffic permits open "motor up" and "slot" circuits of mechanism and swing mechanism and gate arm assembly away from track until arm is parallel to curb or highway edge. (See Fig. 1c.)

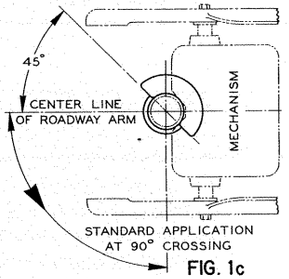
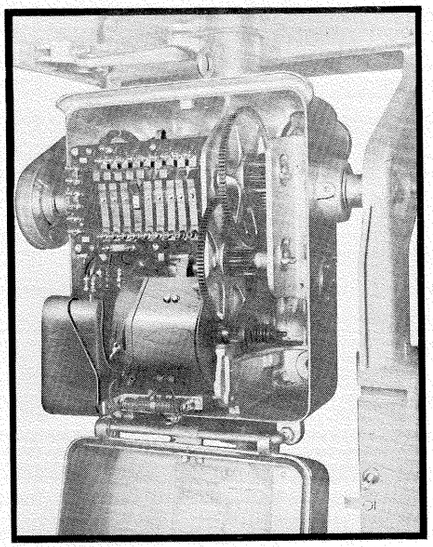
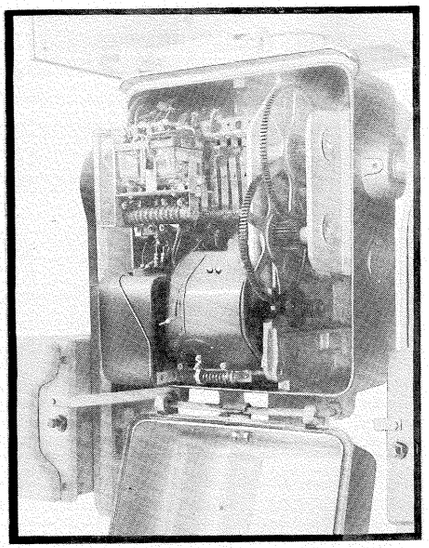


FIG. 1c


Gravity Down Type


Power Down Type

SECTION 2

GENERAL INSTRUCTIONS
MECHANISM OPERATION AND MAINTENANCE

A. Gate Arm Torque:

Counterweights are supplied to suit the particular length and weight of gate arm furnished. They will provide suitable torque for both horizontal and clear position, as given in Paragraphs 13 and 16.

CALIBRATION VALUES shown on the sticker inside the slot cover apply to all gate arm torques. The drop-away voltages shown are specification values. The drop-away voltage will not vary appreciably when taken with full gate torque and with no gate torque. It is recommended that, should the drop-away voltage of mechanisms in service be found to have gradually reduced to the "Min. Drop-Away (field value)" shown on the sticker, the slot be removed for overhauling to bring it back within the "Max. Drop-Away (new)" and "Min. Drop-Away (new)" values shown on the sticker. See Paragraph 19, Section 1.

B. Tests for Operation:

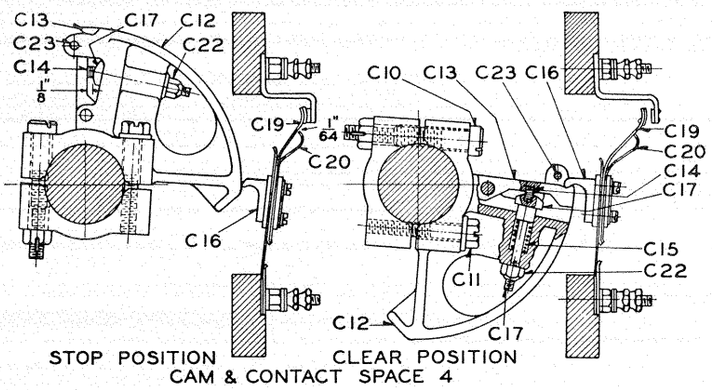
Mechanisms are given a final inspection and are properly lubricated before shipment from the factory.

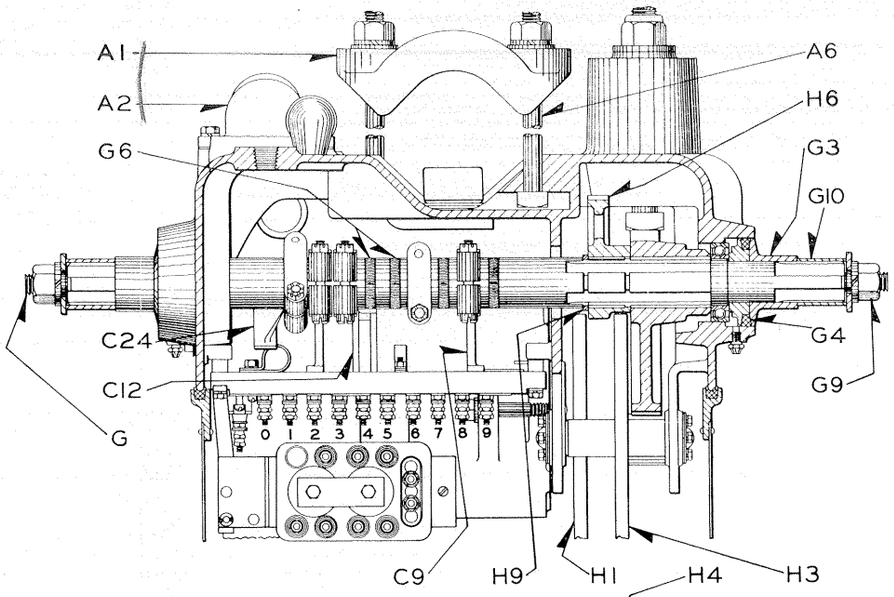
Before placing any mechanism in service, inspection should be made to insure that there is no oil, grease or dirt on the armature or pole faces of the slot magnet or snubbing relay. These parts should be kept clean at all times. See Paragraph 21.

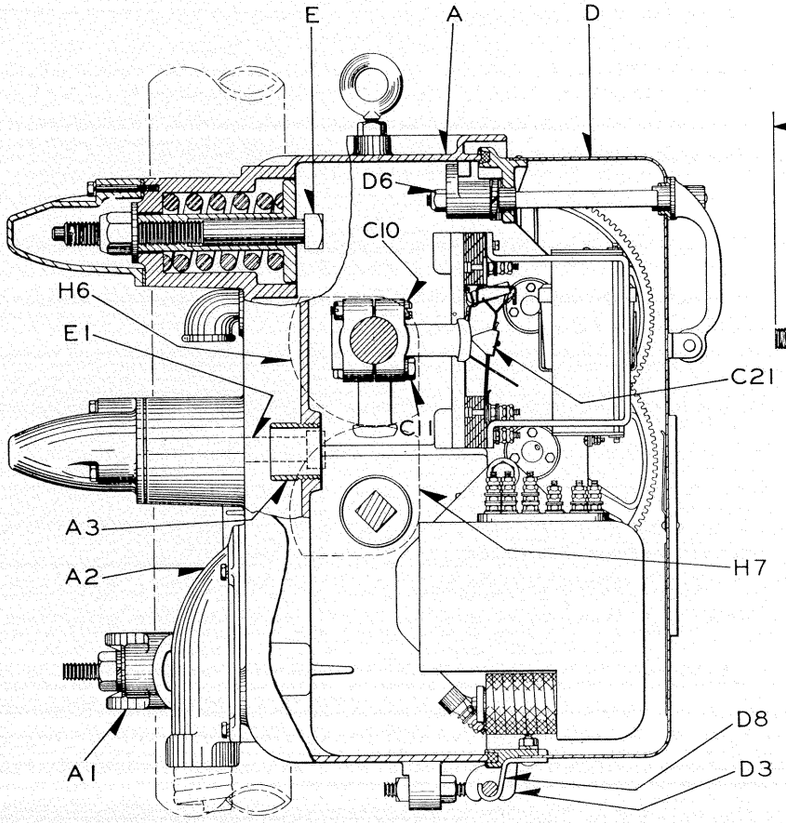
ELECTRICAL TESTS should be made before placing in service, and at regular intervals. Mechanisms located in dense traffic zones should be tested more frequently than under average conditions. See Paragraph 19.

The SNUBBING RELAY, No. 8, Figure 12a, located inside the slot case of gravity type mechanisms or the MOTOR CONTROL AND SNUBBING RELAY, Item R. Figure 10, located on a swing bracket in front of the circuit controller of drive-down type mechanisms, is connected in multiple with the motor and should open its back contact or contacts before closing its front contact to energize the motor whenever energy is applied to drive the gate toward the clear position. When the gate is stationary at either the horizontal or clear position, and while the gate is moving toward the horizontal position, the relay armature should be in the de-energized position with its back contact or contacts closed.

THE TIME FOR THE GATE TO DESCEND from the clear position to the horizontal position should be not more than 15 seconds, nor less than 10 seconds. Descending time may be regulated by means of the adjustable snubbing resistance on the outside of the slot case, No. 12, Figures 12 and 12a, as described in Paragraph 18.


C13
C17
C12
C23
C22
C14
1/8"
C19
1/64"
C20
C16
C10
C13
C23
C16
C19
C20
C14
C17
C15
C22
C11
C12
C17
STOP POSITION
CLEAR POSITION
CAM & CONTACT SPACE 4


A1
A2
G6
A6
H6
G3
G10
C24
C12
G
G4
G9
0 1 2 3 4 5 6 7 8 9
C9
H9
H1
H4
H3


E
A
D
D6
C10
H6
E1
C21
C1
A3
A2
H7
A1
D8
D3

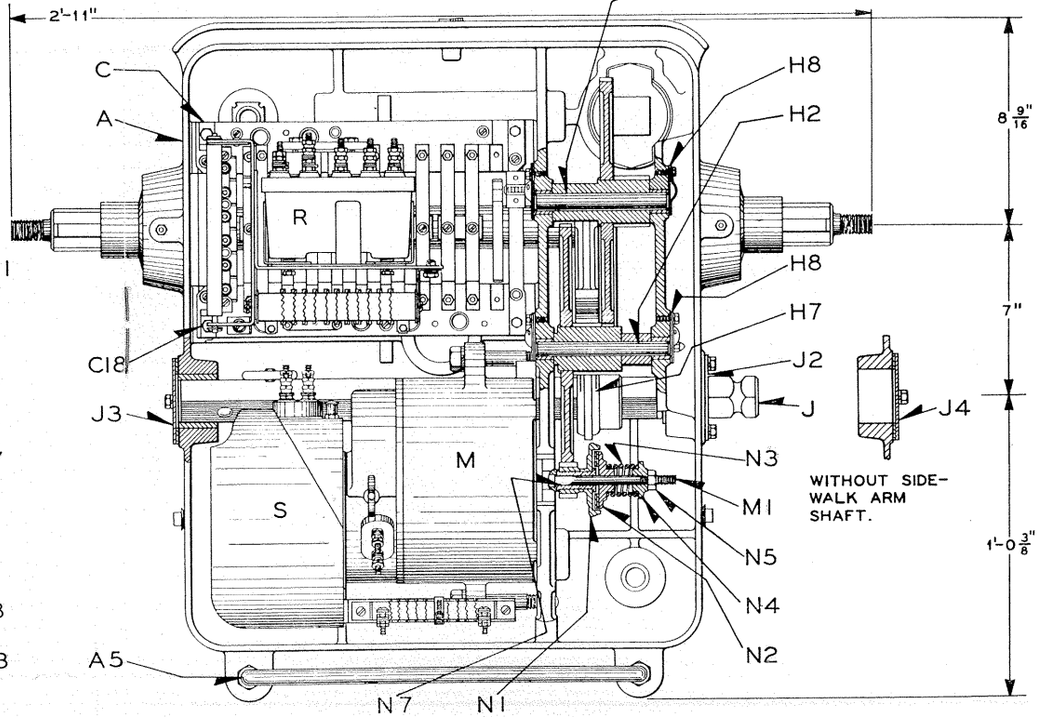

2'-11"
C
A
H8
H2
R
8 9/16"
H8
H7
7"
C18
J2
J3
J
J4
M
N3
S
M1
N5
N4
N2
A5
N7
N1
WITHOUT SIDE-WALK ARM SHAFT.
1'-0 3/8"

FIGURE 10

WIRE SIZE AND BATTERY. Sizes of wire used for motor circuit should be calculated so that there will be not more than 0.1 ohm resistance between the battery and motor terminals.

Wire sizes as follows are recommended:

Distance from Battery Terminals to Mechanism Terminals	Size of Soft Drawn Copper Wire to Use
Up to 60 Feet (120 feet of wire)	No. 9 AWG
From 60 to 120 Feet (240 feet of wire)	No. 6 AWG

The following battery is recommended with above wire sizes for gates of various lengths:

Gate Arm Length In Feet	Clear Position Torque, Foot Pounds	Number Cells Lead Type Storage	Number Cells Nickel-Iron Type Storage
Up to 24	200	6	9
25 to 36	220 to 405	7	11
37 to 40	432 to 480	8	12

CLEARING TIME (Recommended)

Gate Arm Length In Feet	Time In Seconds
Up to 24	8
25 to 36	8 to 10
37 to 40	10 to 12

When planning installations in territory where frost accumulation on mechanism contacts might be expected, thought should be given to providing two wires in cable to permit operation of 75 watt heater if found necessary.

C. General:

All moving parts of the mechanism must, under all conditions of weather operate freely. The parts requiring lubrication should not be allowed to get tight through the use of unsuitable lubricant or lack of lubrication.

Care should be exercised to protect all parts of the mechanism against exposure, and also to prevent foreign substance from getting into parts where there is a possibility of interfering with the proper action of the mechanism.

GATE ARM TORQUE ADJUSTMENT should be checked each time that any change is made in gate arm, location of gate light, or other alteration affecting the total weight of the assembly. See paragraphs 13 and 16.

GATE ARM POSITION ADJUSTMENTS should be properly maintained to avoid ill-appearance of a drooping gate arm when down and to avoid the possibility of travel beyond the desired clear position where gate arm or arm lights may strike the mast or other part of the assembly. See Paragraphs 14 and 15.

D. Lubrication:

A high grade light oil, free from acid, should be used. A.A.R. Sig. Sec. Spec. 103 oil is recommended.

Avoid using too much oil. Always remove all surplus. All principal bearings, except those for the sidewalk gate shaft, are either ball or roller type, and need very little lubrication.

MOTOR AND INTERMEDIATE GEAR SHAFT BEARINGS. Oil each cup every six months.

ROADWAY GATE AND SIDEWALK GATE SHAFT BEARINGS. Fill with non-freezing pressure gun grease every three months. Use W.R.R.S.Co. No. 3564-2513 Pressure Gun Grease (conforming to AAR Sig. Sec. Specification 250) or No. 3564-3970 Low Temperature Lubricating Grease (conforming to Army-Navy Aeronautical Specification AN-G3a. **Do not use Graphite Grease in Ball Bearings.**

GEAR TEETH AND CIRCUIT CONTROLLER CAM SURFACES. No. 3564-3970 Low Temperature Lubricating Grease, if available, should be used to lubricate gear teeth and cam surfaces. It is suitable for all-year use as it will remain plastic and stay on the surfaces at all normal operating temperatures. No. 3564-2513 pressure gun grease is not suitable for summer use on gear teeth and cam surfaces. They may, however, be lubricated by brushing on a light coat of collodial graphite solution, such as "Oildag" although more frequent application will be required.

DRAG SEGMENT CAM SURFACE (Space 4) should be lubricated same as other cam surfaces but draglink pin, spring bolt and guiding surfaces should be lubricated with AAR, Sig. Sec. Spec. 103 oil.

THE FRICTION CLUTCH on the pinion end of the motor shaft **Should Be Kept Free From Oil.**

TRUNNIONS FOR MOVING PARTS IN THE SLOT MAGNET ASSEMBLY and the hold-clear pawl and ratchet wheel should have no more lubrication than is obtained by wiping with a cloth moistened with A. A. R. Sig. Sec. Spec. 103 oil. This should be done every three to six months.

E. Friction Clutch—(Figure 10)

The friction clutch N, Figure 10, on the pinion end of the motor shaft prevents undue strain on the motor and the mechanism gears in case the gate arm is broken off and the gears are driven (by the counterweights) to an abrupt impact against the clear position stop. The motor pinion and drive clutch flange N1 is mounted loosely on shaft M1 and is provided with self-lubricating bushings N7. The clutch driving flange N2 and clutch spring washer N4 are splined on shaft M1.

The clutch spring N-3 is factory adjusted to a length of approximately 1-5/16″. Ordinarily this adjustment, which is not critical, should not be disturbed in service. However, if field adjustment is ever required, it is made by turning the nut N-5 on the end of the motor shaft. A groove in the nut meshes with a tongue on the clutch spring washer and makes this nut self-locking in steps of 1/2 turn.

F. Circuit Controller (Figure 10)

The CIRCUIT CONTROLLER CONTACT ASSEMBLY C is attached to the housing by four screws C18.

The CIRCUIT CONTROLLER CAMS C9, C12 and C24 are mounted directly on the main gate shaft and the angular movement of the cams is the same as the angular movement of the gate.

With the CONTROLLER CAM ARM in the horizontal position, the bottom screw C11 is the clamping screw, and the top screw C10, which meshes with teeth G6 in the gate shaft G, is the adjusting screw. To adjust the position of a cam, loosen the bottom (clamping) screw, and turn the top (adjusting) screw clockwise to raise the cam, or counter-clockwise to lower the cam. After adjustment is made, tighten the bottom (clamping) screw. A recheck of the adjustment should be made after all parts are tightened. (Also see Paragraph 17.)

The TENSION OF THE CONTACT SPRINGS, except the contact spring in space 4 used for motor control, should produce 1/32″ slide on their respective front or back contacts: This is equivalent to 1½ or 2 pounds pressure. The contact spring C19 in space 4, used with the special cam C12 for motor control, should require a load of one pound minimum, one and one-half pounds maximum, to lift the contact C19 off the front stop C20, with the spring balance applied adjacent the front stop, and when the contact is closed the contact should clear the front stop C20 by 1/64″ when the gate is at the zero position. The contact tips should bear on their respective front or back contacts approximately at the center of the contact surface and should make contact across the full width of the contact surface.

CIRCUIT CONTROLLERS should be inspected at regular intervals to check for proper action of their parts, including contact opening. Contacts in spaces 0, 6, 8 and 9 should have ⅛″ minimum contact opening with the cam followers C21 on top of the cams. The contacts in spaces 5 and 7 should have ⅛″ minimum opening with the cam follower entirely off the cam. The contacts in spaces 1, 2 and 3, which are operated by one cam, should have 1/16″ minimum, ⅛″ maximum contact opening, with the cam follower entirely off the cam.

The MOTOR CONTROL CAM C12 with the snap segment C13, which operates the contact in space 4, should have the elastic stop nut C22 adjusted to provide ⅛″ clearance between the top of the spring bolt head C17 and the underside of the snap segment C13 when the snap segment is against the stop pin C23. As the contact in space 4 closes, it should close slowly to within ⅛″ minimum of the fixed contact, and then be completely closed quickly by the snap segment C13 snapping upward. The snap segment should move far enough that the cam follower C16 is up on the periphery of the snap segment.

The contact in space 0 is connected in the circuit and used only in mechanisms equipped to be motor driven 90° to 45° and is operated by cam C-24. This cam is factory adjusted to open the contact with the gate arm in approximately the 45° position. The tension, slide and opening of this contact should be the same as the other contacts, except the contact in space 4.

G. Motor Commutator and Brushes

Clean the motor commutator occasionally with a dry cloth free from oil.

Brush pressure is adjusted at the factory and should not need to be readjusted.

Brushes should not be worn too near the end of their useful life. When the flat spring bearing against upper end of brush comes within 1/16″ of resting on the brush holder it is time to replace the brush.

If necessary to replace brushes, they should be ground with fine sandpaper no coarser than 3/0 to an even seat on the commutator. Do not use emery for this purpose.

H. Slot (Figures 12 and 12a)

All moving parts should have appreciable end play on their respective pivots or trunnions, and should not be restricted in any manner by friction or any tendency to bind.

The stop screw 14 on the armature bar 15 controls the engagement between the ratchet gear 1, and the locking pawl 3 mounted in locking arm 10 and held in normal position against stop pin 6 by return spring 5. This screw is adjusted so that, with the screw against the core support casting, the tip of the locking pawl is just touching the bottom or root of the space between the teeth on the ratchet gear. This adjustment provides for full engagement between the ratchet gear teeth and the locking pawl, and should be so maintained. The lock nut on the stop screw 14 should be tight and locked in position.

The armature bar springs are adjusted as follows: With slot coils energized and the armature 13 held against the pole faces, the nuts 16 are tightened until the coils of the springs are compressed together lightly, then each nut is backed off one and one-half turns and locked in place with the cotter pin.

The length of the stop screw 22 is such that with the lock nut 23 as tight as possible against the head of the screw and the stop screw turned as far as possible into the locking arm, the locking arm is raised to its highest possible de-energized position. With the slot magnets de-energized and the end of the top screw 22 resting on the bottom of the slot case, the tip of the locking pawl should clear the tops of the ratchet gear teeth by at least 0.025″ when the locking arm is raised to its highest possible de-energized position.

The adjustment of the locking arm stop screw 22 should be such as to limit the motion of the armature bar 15 and the armature assembly to 9/16″ maximum, measured at the bottom edge of the armature, when the armature bar is moved by hand from the deenergized position to the energized position so that the stop screw 14 is against the core support casting. This adjustment should be maintained in service. The locking arm stop screw 22 should be locked in position with the lock nut 23 and nut lock 24.

THE SNUBBING RELAY (Fig. 12a — Used only on Gravity Type Mechanisms)

The snubbing relay back contact 9 should make evenly across both tips. With an 0.022″ spacer between the pole face and the stop pin 11 and with the armature energized, the back contact 9 should be just open. There should be approximately 0.010″ clearance between the contact arm and its back stop 17, and the opening between the back contact spring 9 and its stop should be 1/64″ minimum when the armature is in the de-energized position. With the armature in the energized position, the back contact opening should be 0.050″ minimum.

The snubbing relay front contact 20 should make contact centrally on the contact surface 21. With an 0.013″ spacer between the pole face and the stop pin 11 and with the armature energized, the front contact 20 should be just open. With the 0.013″ spacer removed and with the armature stop pin against the pole face in the energized position of the armature there should be 1/64″ minimum opening between the front contact spring 20 and its stop. With the armature in the de-energized position, the front contact opening should be 0.050″.

The hold down or compression spring 18 should be adjusted by means of the adjusting nut 19 so that, following a charge of 12 volts, the armature will drop away when the voltage is gradually reduced to 5.5 volts maximum, 5.0 volts minimum. After opening and then reclosing the snubbing relay circuit, the armature should pick up on not more than 7.5 volts. The locking spring 17 should exert sufficient pressure against the adjusting nut 19 to prevent the nut from turning.

I. Motor Control and Snubbing Relay (Figure 10, Item R)

(Used only on mechanisms motor driven 90° to 45°.)

The motor control and snubbing relay is supported on a shock absorber mounting bracket which may be swung to the left, away from the front of the circuit controller, for inspection or adjustment of the circuit controller contacts or cams.

Field Test: When drop-away value is 2.40 volts or less; or pick-up is more than 9.02 volts the relay should be removed for shop repairs. Shop repairs should be in accordance with manufacturers service specifications.

J. Wiring Diagrams

The tables on pages 24 and 25 show the standard adjustment of all circuit controller contacts as set at the factory and indicate the use to which each is put in properly controlling the other components of a standard Model 10 Crossing Signal.

Figure 13 illustrates the arrangement of mechanism wiring for the operating circuits for the Type 3564-71 or 3564-72 mechanism which operates 90° to 0° by gravity.

Figure 14 shows a typical circuit for the control of complete Model 10 Signals equipped with this type mechanism.

Figure 13a illustrates the arrangement of mechanism wiring for the operating circuits for the Type 3564-131 or 3564-132 mechanism which operates 90° to 45° by power and 45° to 0° by gravity.

Figure 14a shows a typical circuit for the control of complete Model 10 Signals equipped with this type mechanism.

SLOT ASSEMBLIES

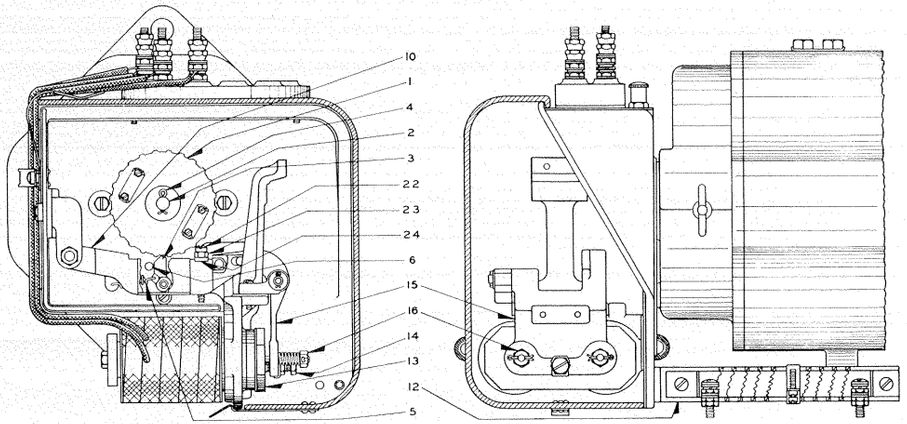


FIGURE 12

For Power Down Type Mechanism.

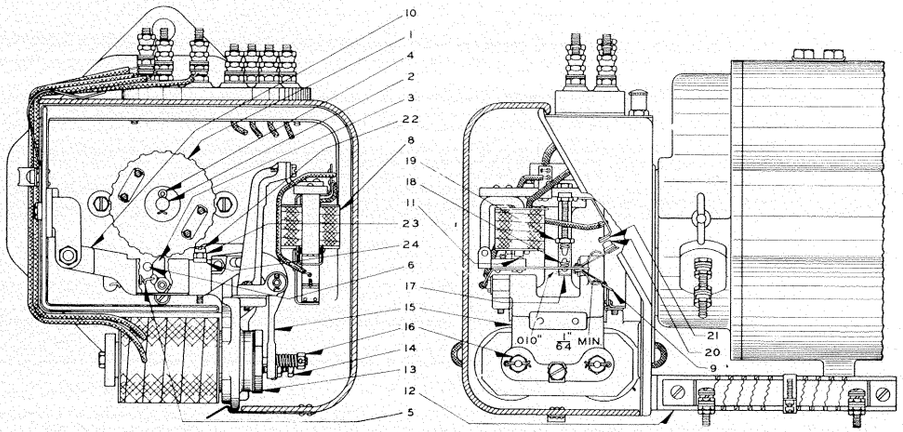
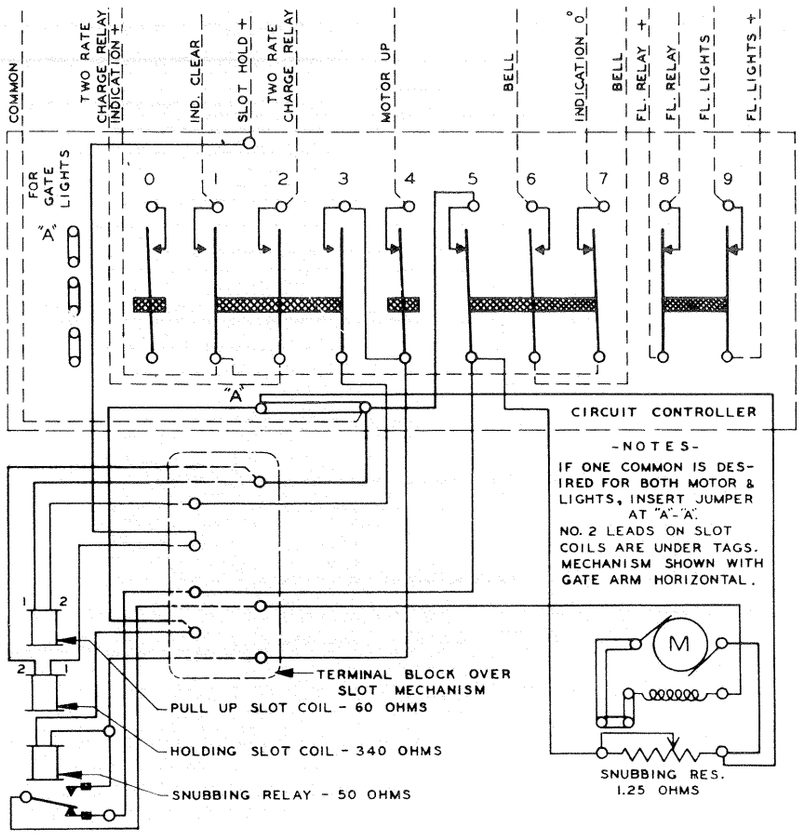


FIGURE 12A

For Gravity Down Type Mechanism.

MECHANISM WIRING DIAGRAM
GRAVITY TYPE MECHANISM

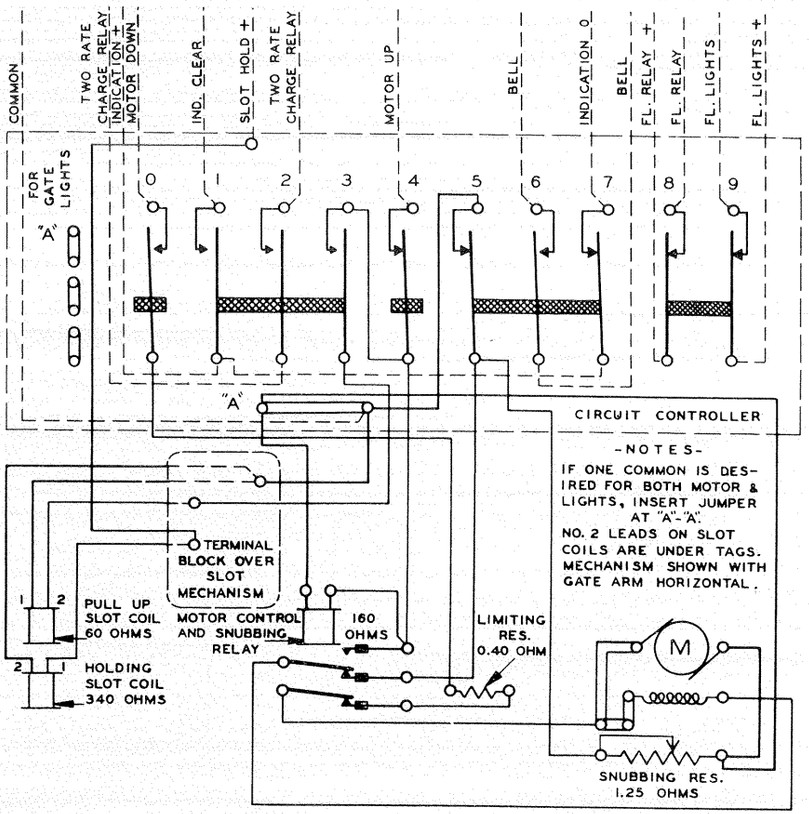


CIRCUIT CONTROLLER OPERATION & FUNCTIONS

SPACE NO.	USE OF CONTROLLER	CONTACT CLOSED	CAM DRIVES CONTACT
0	SPARE.	46° TO 93°	OPEN
1	TO LIGHT INDICATOR LAMP WHEN GATE IS CLEAR. (SPARE WHEN INDICATION IS NOT REQUIRED).	86° TO 93°	CLOSED
2	TO CONTROL TWO RATE CHARGE RELAY, WHEN GPR RELAY IS NOT USED.	86° TO 93°	CLOSED
3	TO PULL UP SLOT MAGNET.	86° TO 93°	CLOSED
4	TO CUT OFF MOTOR AFTER GATE HAS CLEARED.	0° TO 89° UP 83° TO 0° DOWN	CLOSED
5	TO CLOSE HEAVY SNUB CIRCUIT AS GATE ARM APPROACHES HORIZONTAL.	0° TO 5°	CLOSED
6	TO OPEN BELL CIRCUIT WHEN GATE ARM IS HORIZONTAL.	5° TO 93°	OPEN
7	TO LIGHT INDICATOR LAMP WHEN GATE IS HORIZONTAL (SPARE WHEN INDICATION IS NOT REQUIRED).	0° TO 5°	CLOSED
8	TO KEEP FLASHER RELAY WORKING UNTIL GATE HAS CLEARED, WHEN GPR RELAY IS NOT USED.	0° TO 89°	OPEN
9	TO KEEP LIGHTS BURNING UNTIL GATE HAS CLEARED, WHEN GPR RELAY IS NOT USED.	0° TO 89°	OPEN

FIG. 13

MECHANISM WIRING DIAGRAM
MECHANISM MOTOR-DRIVEN 90° TO 45°



CIRCUIT CONTROLLER OPERATION & FUNCTIONS

SPACE NO.	USE OF CONTROLLER	CONTACT CLOSED	CAM DRIVES CONTACT
0	TO OPEN MOTOR DOWN CIRCUIT.	46° TO 93°	OPEN
1	TO LIGHT INDICATOR LAMP WHEN GATE IS CLEAR. (SPARE WHEN INDICATION IS NOT REQUIRED).	86° TO 93°	CLOSED
2	TO CONTROL TWO RATE CHARGE RELAY, WHEN GPR RELAY IS NOT USED.	86° TO 93°	CLOSED
3	TO PULL UP SLOT MAGNET.	86° TO 93°	CLOSED
4	TO CUT OFF MOTOR AFTER GATE HAS CLEARED.	0° TO 89° UP 83° TO 0° DOWN	CLOSED
5	TO CLOSE HEAVY SNUB CIRCUIT AS GATE ARM APPROACHES HORIZONTAL.	0° TO 5°	CLOSED
6	TO OPEN BELL CIRCUIT WHEN GATE ARM IS HORIZONTAL.	5° TO 93°	OPEN
7	TO LIGHT INDICATOR LAMP WHEN GATE IS HORIZONTAL (SPARE WHEN INDICATION IS NOT REQUIRED).	0° TO 5°	CLOSED
8	TO KEEP FLASHER RELAY WORKING UNTIL GATE HAS CLEARED, WHEN GPR RELAY IS NOT USED.	0° TO 89°	OPEN
9	TO KEEP LIGHTS BURNING UNTIL GATE HAS CLEARED, WHEN GPR RELAY IS NOT USED.	0° TO 89°	OPEN

FIG. 13A

TYPICAL CIRCUIT
Mechanism Operated 90° to 0° by Gravity

Plan 5800-451

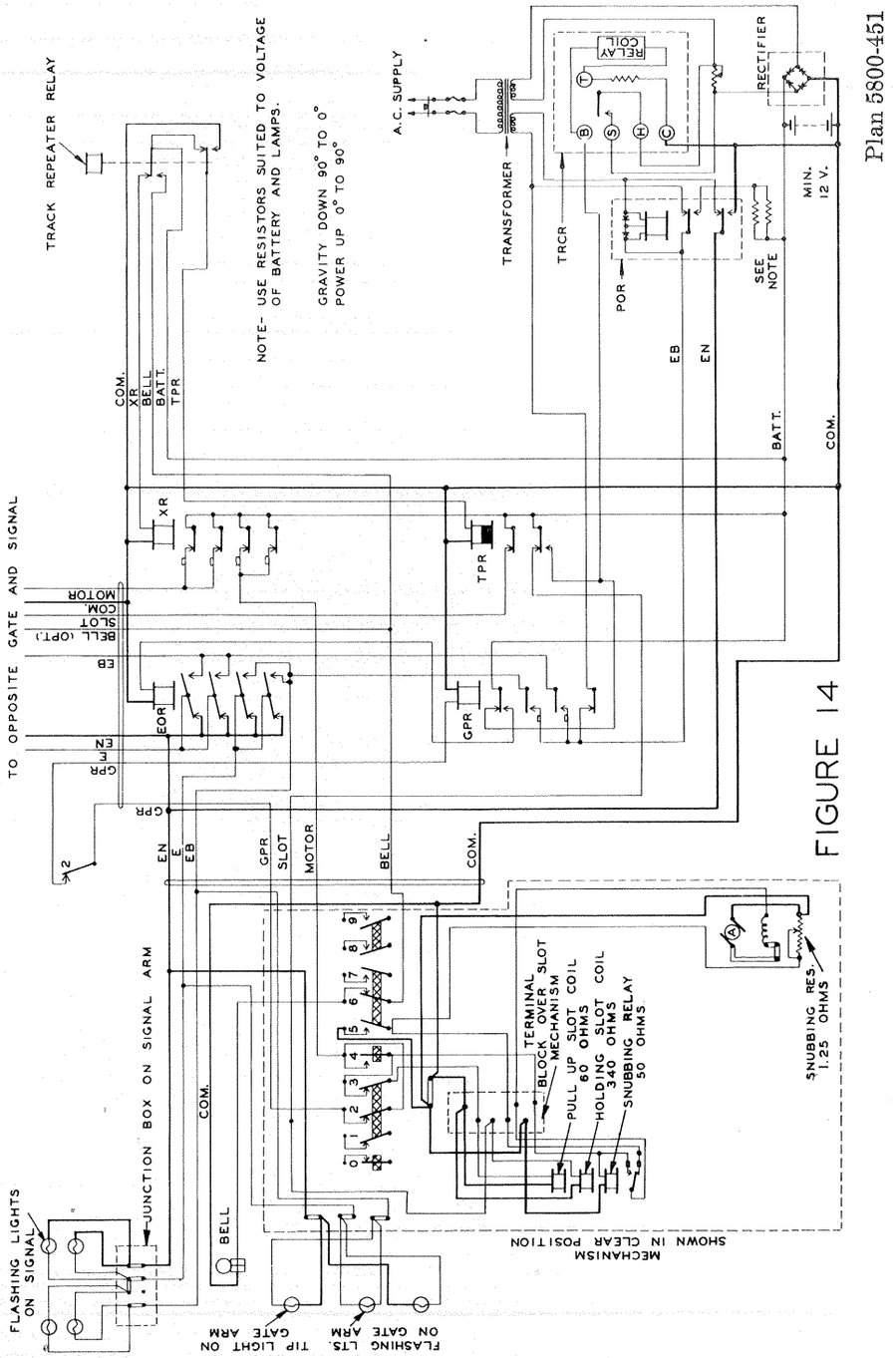


FIGURE 14

TYPICAL CIRCUIT
Mechanism Operated 90° to 45° by Power and 45° to 0° by Gravity

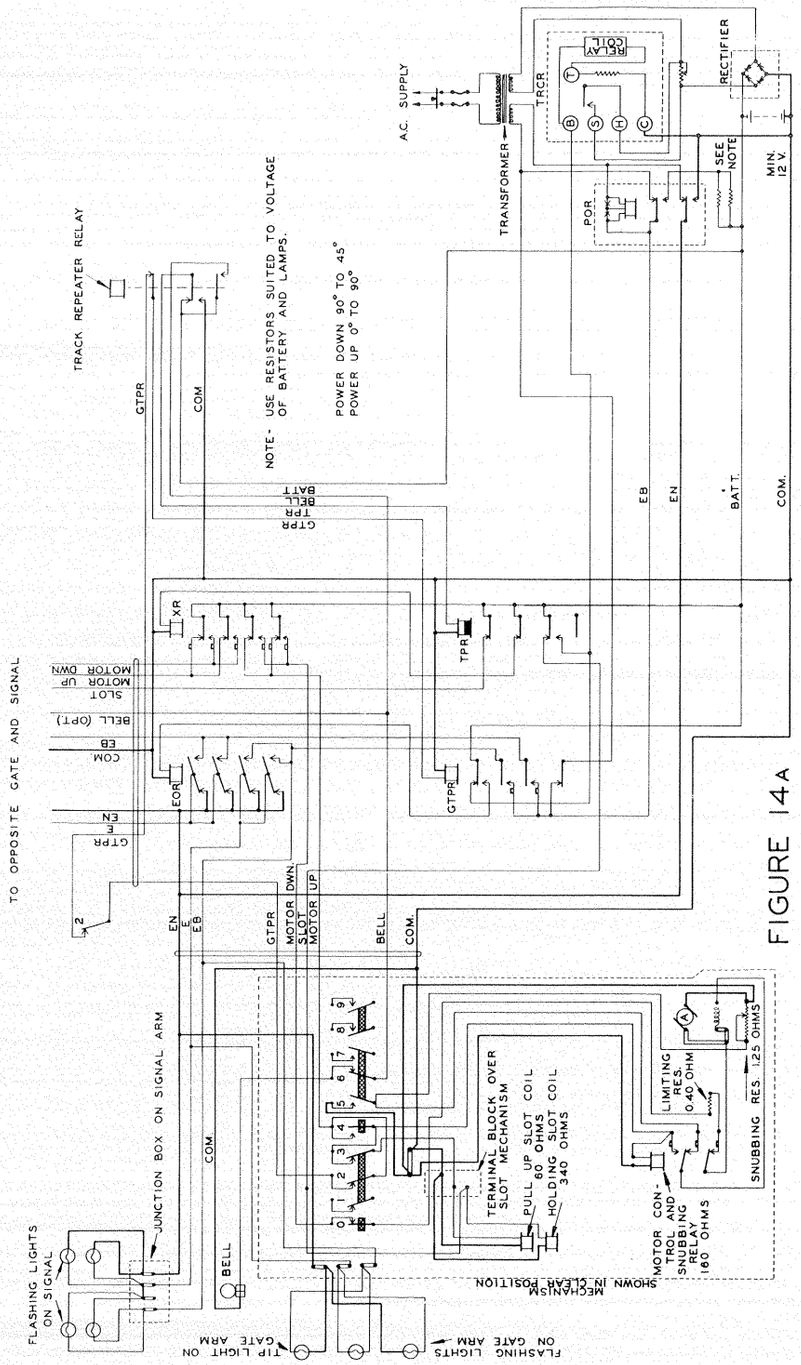


FIGURE 14A

SECTION 3

I. GENERAL DESCRIPTION OF MECHANISM

Mechanisms of both types are regularly furnished with one main shaft, both ends of which are splined for mounting cast iron supporting members to which are attached the counterweights and a sheet steel support for the wood roadway gate arm. When a sidewalk arm is required in addition to the roadway arm, an additional shaft is provided (geared 1:1 with the main shaft) extending through one side of the mechanism case; on this shaft is mounted a suitable casting for supporting the sidewalk gate arm as shown in Figure 1a.

The gravity type mechanism is designed to move the gate arm or arms from the horizontal position to the vertical or clear position by means of a D.C. electric motor and gear train, and to hold it in the clear position by means of a ratchet and pawl while energy is maintained on a slot or hold-clear magnet. Whenever the hold-clear magnet is de-energized the gate arm or arms move to the horizontal, or stop position, by gravity driving the motor backward. The motor acting as a generator, restrains the descent by discharging its current through the snubbing resistance. The time of descent may be regulated by adjusting the snubbing resistance in the generator circuit.

The mechanism motor driven 90° to 45° is designed to move the gate arm or arms from the horizontal position to the vertical, or clear position by means of a D.C. electric motor and gear train, and to hold it in the clear position by means of a ratchet and pawl while energy is maintained on a slot or hold-clear magnet. Whenever the control circuits are changed to de-energize the hold-clear magnet and to energize the motor through the limiting resistance, the gate arm is driven toward the horizontal or stop position, until the circuit controller contact in space 0 is opened by a cam C-24 (Figure 10). Further movement of the gate arm toward the horizontal, or stop position, is by gravity with the motor acting as a generator which restrains the descent by discharging its current through the snubbing resistance. The time of descent may be regulated by adjusting the snubbing resistance which is in the motor circuit from 90° to 45° and in the generator circuit from 45° to 0°.

With this type of operating mechanism, that is power-driven for both directions of gate arm travel, the gate arm torque is purposely maintained sufficiently unbalanced that in the event of power failure the gate arms will have the same strong tendency to fall to the horizontal position as do the gate arms on mechanisms

that are normally operated by gravity to the horizontal position. This tendency to fall is expressed in foot-pounds of torque. See table page 10.

Counterweighting is necessary to overcome a portion of the natural torque of gate arms and these weights provide a means of adjusting both the horizontal and vertical torque to desired values for gate arms of varying lengths from 12′ minimum to 40′ maximum. Gate arm length is considered to be the distance from the center line of the supporting mast to the tip of the gate arm. Recommended torque values for gate arms of various lengths are given in the table which appears in Section 1, Figure 9.

II. ASSEMBLIES

The Type 3564D mechanism is designed for clamping to the side of a 4″, 5″ or 6″ diameter steel pipe mast on which the other components of a Model 10 crossing signal are also generally mounted. The mechanism is so designed that it can be used on signals placed at either the right or left side of the roadway.

Typical assemblies of Model 10 Signals with type 3564D Mechanism are shown in Figures 1, 1a, 1b and 2. Often additional Flashing Light units are required because of side or branch roads. Suitable extension brackets, dowel masts and other fittings are available to enable almost any situation to be met. Given details of special requirements our Engineering Department will prepare sketches showing suitable methods of mounting such auxiliary devices as are needed at any specific location.

Since Flashing Lights and signs mounted on standard junction box cross-arms and adaptor clamps would interfere with the gate arm in the clear (90°) position, they are set out on extension brackets as will be noted in Figures 1, 1a and 2.

For gate arms from 12′ up to and including those 24′ 0″ in length a sufficient amount of counterweight can be attached to one counterweight support arm as shown in Figures 1, 1a and 1b. Where gate arms exceed 24′ 0″ in length two counterweight support arms are supplied and the weights are divided between them as illustrated in Figure 2.

III. DETAIL DESCRIPTION OF MECHANISM (Figure 10)

HOUSING:

The housing A is held to the mast by means of two pole clamps A1. The heads of clamp bolts A6 fit in Tee slots in housing A and the shanks through slotted holes in the clamps A1. The parts are so designed that the case can be attached to either a 4″, 5″ or 6″ steel pipe mast.

The regular wire inlet to the mechanism is by means of 2″ diameter flexible metallic conduit extending from the fitting A2 on back of mechanism case to a suitable fitting in the junction box half of the base or other junction box on the mast. (See Figures 1, 1a, 1b and 2.) When desired to bring parkway cable directly to the mechanism the use of the flexible metallic conduit is dispensed with, but the fitting A2 is used for protection of the cable where it enters the case.

A wire opening into the mast from the mechanism case is provided at A3 and consists of a 2″ pipe nipple threaded at one end into the back of the mechanism case. This nipple is shipped inside the mechanism case and the 2″ pipe threaded hole at A3 is closed by means of a 2″ recessed head pipe plug which should be left in place if the entrance at A3 is not to be used.

COVER:

The Cover D is provided with open ended hinge lugs D3 on the bottom, which hook over hinge U-bolt A5. Hinge strap D8 holds the cover in position on the hinge bolt, but can readily be removed when it is desired to detach the cover. The nuts on hinge bolt A5 are adjustable to provide for taking up on the packing. The cover is fastened at the top by means of a specially designed latch assembly, which can be adjusted to obtain proper compression of the packing by turning self-locking nut D6. Hasp eyes in the latch handle and on the door front provide for padlocking.

GATE ARM SHAFT:

The gate arm shaft G is mounted on single, shielded, snap ring type ball bearings, which are lubricated through pressure grease fittings and protected on the outside by grease felt seals G4. The nuts G9 hold the ball bearings, felt seal sleeves G3 and gate arm hub together, against shoulders on the shaft. This shaft is of large diameter to withstand any expected twist and the connections to the gate and counterweight support arms are splined to provide great resistance to wear and ample strength.

The gate arm shaft can be removed by removing the circuit controller cams C9 and C12, nuts G9, the counterweights, gate arm and supporting arms; and then pulling the shaft out to the left. In replacing the ball bearings, the sealed side should always be toward the inside of the mechanism housing.

SIDEWALK ARM SHAFT:

The sidewak arm shaft J, when used, is driven by segmental gears H6 and H7 from the main gate shaft G with a ratio 1:1. In Figure 10 it is shown projecting from the right side of the mechanism case as it is normally assembled at the factory. It can, however, be made to project from the left side by interchanging bushing J2 and end plate J3, and turning the shaft end for end.

When the sidewalk arm shaft is not required, the openings in the housing A are closed by means of blank plates J4, used in place of end plate J3 and bushing J2. The segmental gear H6 is omitted and the retaining ring H9 is located as shown.

ADJUSTABLE SPRING GATE STOPS:

The adjustable spring gate stop assemblies E and E1, Figure 10, are provided to position the gate in the horizontal position and also to provide means of absorbing the shock at the end of the travel in normal operation, and when the mechanism is suddenly stopped when moving at high speed as will be the case if the gate arm is broken off and the mechanism moves rapidly to its clear position.

Each stop assembly is provided with sufficient adjustment to take care of normal manufacturing variations, and also so that the mechanism may be stopped as much as 15° short of its full 90° travel. (See Figure 8 and Paragraphs 14 and 15.)

REDUCTION GEAR TRAIN:

The gears are made of heat treated steel and provide a reduction of 220:1 between the motor shaft and the gate shaft.

The intermediate gear assemblies H1 and H3 are a light fit on their respective intermediate shafts H2 and H4 and may be removed by taking off end plates H8 and driving the shafts out. The intermediate shafts are carried on needle bearings and provide for oil lubrication. If it becomes necessary to remove or replace the needle bearings, a puller should be used to avoid damage to the outer roll. The gears should run freely and there should be 0.005″ minimum end play between the hubs and the housing.

CIRCUIT CONTROLLER CONTACT EQUIPMENT:

A maximum of six contact springs in addition to the three required in spaces 3, 4 and 5 for the gravity-return type of operating mechanism or the four required in spaces 0, 3, 4 and 5 for the drive-down type of operating mechanism for motor, slot and snubbing circuit control can be provided. By selecting suitable cam followers and by arrangement of the cams any desired grouping of contacts is possible. This is because the cams are so designed that the cam operating face may be assembled so as to be either side of the center line of the teeth G6 in the gate shaft.

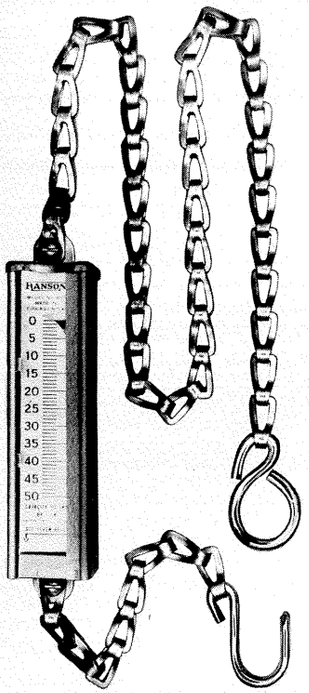
Moulded bakelite contact cam followers C21 attached to the contact springs, are available for operating the springs in groups of 1, 2 or 3. Standard contact arrangements are shown in Figure 13 and 13a. They may be adjusted to meet special requirements as described in Paragraph F, Section 2.

FLEXIBLE COUPLING (Figure 12):

The ratchet gear 1 forms the outer part of a flexible coupling assembly, the inner part of which is splined to the motor shaft 2. It should be noted that, whenever the pawl 3 stops the ratchet gear at the clear position of the gate arm, the force of the gate arm torque will cause the motor shaft to reverse a slight amount with respect to the stationary ratchet, before it comes to rest.

Removal of cotter 4 will permit the assembly of the flexible coupling to slide off the motor shaft, for inspection when required.

NOTE: No. 3564-2513 Pressure Gun Grease
and
No. 3564-3970 Low Temperature Lubricating Grease
may be obtained from Western Railroad Supply Company in one gallon cans.



Appropriate spring scales complete with chain and hook, for measuring torque, may be ordered from Western Railroad Supply Company by specifying:

No. 3562-210 Torque Adjusting Scale Assembly.

Illustration 1/3 Actual Size.

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